$$y = p + qx - rt \ldots\ldots\ldots\ldots\ldots\ldots (1),$$

p being the constant introduced by integration.

Because $bA = a' + nt - x$, we have, by similar triangles, $v : a' + nt - x :: rdt : mdt + dx$. Substituting for y from (1) and reducing we get

$$\frac{dt}{dx} = \frac{p + qx - rt}{(a'r - mp) - (r + mq)x + r(m + n)t} = \frac{p + qx - rt}{p' - q'x + r't} \ldots\ldots (2).$$

When $y = 0$, in (1), $x = a + a'$, and $rt = ra \div n$.

$$\therefore\ p = \frac{ra}{n} - \frac{m + n}{r}.(a + a') = \frac{ra}{n} - \frac{m + n}{r}.a - \frac{m + n}{r}.\frac{m}{n}.a$$

$$= \frac{r^2a}{rn} - \frac{mn + n^2}{rn}.a - \frac{m^2 + mn}{rn}.a = \frac{a[r^2 - (m + n)^2]}{rn}.$$

If it were required to determine the length, z, of the curve, because $dz^2 = Bf^2 = Bi^2 + if^2 = Bc^2 - ci^2 + (ci - cf)^2 = r^2dt^2 - dx^2 + dx^2 - 2mdxdt + m^2dt^2 = r^2dt^2 + m^2dt^2 - 2mdxdt$,

$$\therefore\ dz = \sqrt{(r^2 + m^2)dt^2 - 2mdxdt} \ldots\ldots\ldots (3).$$

Because (2) is reducible to a homogeneous equation it may be integrated in finite terms, and hence, by substitution in (3) we have dz in functions of a single variable, which being integrated will give the length of the curve.

Messrs. S. W. Salmon, of Mt. Olive, N. J., and R. M. DeFrance, of Mercer, Pa., each sent an elegant solution of Mr. Stille's question, but as either of the above methods applies equally well to that case we reluctantly omit their publication.—Ed.]

PROBLEMS.

41. By J. P. Child, Salem, Iowa.—Given $x^2 + y = 7 \ldots\ldots\ldots (1),$

$$x + y^2 = 11 \ldots\ldots\ldots\ldots\ldots (2),$$

to find the values of x and y.

42. By Philip Hoglan, Newcomerstown, Ohio.—Find two integral numbers the difference of whose squares is a cube, and the difference of their cubes a square.

43. By L. Regan, Boonsboro, Iowa.—Let AB and AC be two lines intersecting each other at right angles in A, and D, any point given in position. Required the position of a line EF through D intersecting the lines AB and AC in E and F, so that $(ED)^2 + (DF)^2 = m^2$.

44. By George L. Dake, Cleveland, Ohio.—If a circle be divided into three equal parts by two parallel chords, find the perpendicular distance between the chords in terms of the radius.

45. By Elias Schneider, A. M., Sunbury, Pa.—Required the area and sides of an obtuse angled triangle whose angles are to one another as 2, 3 and 7 and whose longest side equals 1. No logarithms to be used in the solution.

46. By Kate R. Mason.—The area of the piston of a high-pressure engine is 1200 square inches, the length of stroke 8½ ft., the pressure of steam upon the piston 32 lbs. per sq. inch and the number of strokes per min. 18. Required the number of cubic feet of water the engine will raise from a mine 60 fath. deep, the friction being estimated at 1 lb. per sq. inch, plus the pressure of the atmosphere.

47. By Henry A. Roland, Troy, N. Y.—What are the forces of inertia acting on a given point of mass m in the axis of the connecting rod of a steam engine whose crank arm moves with uniform angular velocity w?

48. By Artemas Martin, Erie, Pa.—A cylindrical tower, radius r, is surrounded by a walk, width a. Two persons are on the walk; what is the probability that they can see each other?

49. By Prof. D. M. Sensenig, Millersville, Pa.—How far will a man travel in unwinding an inch rope from a frustrum of a cone whose upper diameter is 2 ft., lower diameter 15 ft., and height 35 ft., the rope to be closely wound around the frustrum from top to bottom?

50. By Prof. A. Hall, Naval Observatory, Washington, D. C.—Assuming the earth's orbit to be a circle, if a comet move in a parabola around the sun and in the plane of the earth's orbit, show that the comet cannot remain within the earth's orbit longer than 78 days.